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tion of ponderable matter, of the important question of the constitution of the ether, of the history of atomistic theories and of organic and inorganic matter. In the following chapters, so far as the second installment, we have discussions of the porosity of matter, with demonstrations and suggestions of its significance in applied science. Atmospheric pressure is treated, barometers, and manometers fully described, and finally, there is a long and important chapter on aggregate states of matter. The biological and physiological chapters in the first two installments contain a wealth of material, brought down to date. The pathogenic properties of organised matter are treated of here, the conditions of fermentation and of the production of disease by bacteria, with good studies of typical forms of micro-organisms. The bibliography is particularly full and valuable.

The third installment, which has not yet reached our hands, will deal mainly with the science of energetics, including heat, gravitation, radiant and chemical energy, discussing the sources of energy, its laws, the foundations of modern chemistry, and not omitting other branches of physics which are of importance in the propædeutical studies which the author has in view.

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ESSAIS SUR LA PHILOSOPHIE DES SCIENCES. Analyse.—Mécanique. Par C. De Freycinet. Paris: Gauthier-Villars et fils. 1896. Pages, 336.

M. Freycinet seeks to answer such questions as, What is the exact nature of the notions of infinity and infinitesimal quantities whereon the higher analysis rests? Wherein does the "invention of Leibnitz" differ from the common algebra? What share of the contents of mechanical principles is to be assigned to reasoning and what to experience? What assures the conservation of force and energy? May we predict a gradual slackening of the causes that agitate matter? And so forth.

The notions of Analysis, M. Freycinet contends, are derived directly from the notions of space and time, which for him are necessary, infinite, continuous, and homogeneous. His speculations on this topic are essentially based upon the reflexions of Pascal who, he says, would certainly have invented the Differential Calculus had he not been early called away from science by his excessive religiosity. Infinity is immanent in nature and inherent in mind, escaping intimate comprehension, yet serving accurately our purposes,—a necessary attribute of the world of sense and intellect: and hence its power. The parallelism of mind and nature, in fact, runs all through M. Freycinet's book, and furnishes him with a satisfactory key to many metaphysical problems. So here, after an examination of the Calculus and of its applicability to Physics, he finds "that the Infinitesimal Analysis is alike admirably adapted to the phenomena of nature and to the conceptions of human reason,—apparently forming a bond of union between the intellect and the outer world, which is the highest commendation one can bestow upon it." And the same consideration is applied to the notions of Mechanics, where it is said that "the human mind and nature form integral parts of the same system, by virtue of which the one is richly equipped for the comprehension of the other;" and he illustrates his idea by the example of the Apollonian discovery of conic sections, centuries before their employment as a model of the planetary system. Generally Mr. Freycinet's reflexions upon the subject of limits and the infinitesimal method are lucid and unobjectionable, and from their simplicity may be re-

commended to elementary students. He finds the two ideas of limits and infinitesimals to be conjoint, correlative notions, not at all illogical, and sees the difference of common algebra and the infinitesimal method in the sameness, the simple more-or-less-ness, of the quantities dealt with by the former, and the non-identity, not excluding a sort of homogeneity, of the variables and limits of the latter.

In the chapters on Mechanics, we have numerous elucidative discussions, at times not unmixed with metaphysics. On the ground that the slightest impulse can impart motion to the largest mass, we are led to the statement that "resistance is never *in* the body but always *without* the body,"—a proposition full of light and truth, but entirely depending on the definition of "resistance," and when true only equivalent to its premise. After an examination of the circle-argument involved in the description of mass in terms of quantity of matter, mass is defined as "the expression of relative mobility."

One ingenious point is the enunciation of the idea of *dynamic capacity*,—an analogue of calorific capacity, or of the idea of specific heat. We may say, according to the author, that the same volumes of water, lead, mercury, etc., *absorb* different quantities of force or "impulsion," just as they do different quantities of heat. And as we construct scales of specific heats, so we could construct dynamic scales of bodies, which would give what is commonly called their "quantity of matter" or mass. We see here the form Physics might have taken on, had it been possible to start from heat instead of motions of masses. The idea, at least in its order, is not new.¹

M. Freycinet insists clearly and repeatedly on the separation of experience from reason in the contents of Mechanics, and also on many other sound fundamental doctrines. We have not time to enter into the physical metaphysics of the latter chapters of M. Freycinet's book; we wish merely to indicate the scope and general aim of the work. M. Freycinet is a distinguished French engineer, a member of the National Institute, and already well known as a writer upon the philosophical aspects of scientific questions. He has always applied himself by predilection to the questions involved in the epistemological foundations of the Calculus and mechanics, and his present work is a continuation of former investigations in this domain. One is constrained to admire the conciseness and directness of his expositions, as also the apt and simple style in which they are conveyed. Altogether we have a very readable book, combining commendable internal and external excellences.

T. J. McC.

N. B.—Reviews of works by Dr. Jodl, Dr. Eucken, Dr. Mach, Dr. Ratto, and others have been crowded out of the present *Monist*, as have also the "Contents of Periodicals."

¹ See Mach, *Ueber die Erhaltung der Arbeit*, Prague, 1872; *Popular Scientific Lectures*, Chicago, 1894, pp. 168-171.